DO FOREST-DWELLING BIRD COMMUNITIES CARE ABOUT STREAM AND FLOODPLAIN GEOMORPHOLOGY?

Stephanie Hyder[1], C. Rhett Jackson[2], Robert J. Cooper[3]

AUTHORS: [1]Graduate Student, [2]Assistant Professor, and [3]Associate Professor, Warnell School of Forest Resources, The University of Georgia, Athens, GA 30602
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Abstract. The objective of this project is to determine the habitat requirements of bottomland forest-dwelling bird communities, specifically neotropical migrants, whose populations are declining nationwide. The primary goal is to determine if stream and floodplain geomorphology characteristics are useful predictors of habitat requirements for these birds. Our preliminary results show that clearcuts support equally abundant bird communities as interior forests, including species considered "area sensitive", such as Acadian Flycatcher (*Empidonax virescens*) and Louisiana Waterthrush (*Seiurus motacilla*).

INTRODUCTION

Neotropical migrants are experiencing population declines for unknown reasons (Hamel et al 1996). These birds nest in North America in the spring months, rear young through the summer, then migrate to Mexico, the Caribbean and South America during the winter. Point counts and breeding bird surveys indicate that over half of the species found in bottomland hardwood forests may be neotropical migrants (Hamel et al 1996). Research has shown that the birds use these areas for nesting sites, brood rearing and food resources. The effects of forest, floodplain and stream alterations on neotropical migrant populations are not well understood (Pashley and Barrow 1992). This study seeks to better understand the specific habitat requirements of forest dwelling bird communities, and why these birds are drawn to bottomland hardwood forests. The question we are seeking to answer is whether birds care about the geomorphology, the stream and floodplain size and shape, of these forests?

Geomorphology is a term used to describe the shape, size and temporal evolution of a stream and its floodplain. The slope and width of a stream determines the velocity, substrate size and channel characteristics, such as distribution of pools, riffles and meanders. The shape and slope of the channel banks is also very important. Bank slope may be incised, sloping or flattened and the amount and type of vegetation varies depending on the slope. Incised channels typically have very little vegetation and due to the undercutting of the stream may provide woody debris to the channel. Geomorphology is important to many organisms that occupy these areas. Many fish and aquatic invertebrate species depend on fast flowing waters and rocky substrate for survival. Others persist well in the deeper pool habitats that typically occur on the outer edge of meanders. Furthermore, woody debris is utilized by many fish, invertebrates and amphibians for habitat and food resources.

Floodplain geomorphology is determined by valley slope, topography, size, geology and landscape history. Floodplains may be terraced, sloping or very narrow and may have unique soil and moisture index characteristics. Aquatic species often depend on nutrients from soil, leaf litter and woody debris, which enter the stream system from the floodplain and provide important resources. Wide, marshy floodplains support a variety of vegetation types. These forests are commonly found in the southeastern United States and are frequently referred to as bottomland hardwood forests. These forests support a diversity of species, including neotropical migratory birds.

The coastal plain and piedmont regions of many southeastern states are "hot spots" for logging activities well as for alteration of the floodplains and for development of riparian forests. Ecologists, biologists and land managers are increasing their focus on these areas to better understand how forestry practices, which may alter floodplain and stream characteristics, influence the neotropical migratory songbird communities that inhabit riparian forests.

Timber companies most often are required to leave a "buffer" or strip of hardwoods surrounding a stream or river to prevent bank erosion, protect stream shading and filter sediment runoff when harvesting. This practice is recommended as a Best Management Practice (BMP). BMPs were introduced as part of the Erosion and Sedimentation Act of 1975. Clearcutting forests, particularly those that are adjacent to streams, creates an "edge" habitat that did not exist before the cut. This edge may attract species of birds that would not normally be found within an interior bottomland forest.

It is not fully understood whether buffers support bird communities that are as abundant and diverse as those in interior riparian forests, where cutting has not taken place. A second objective of this study, therefore, is to better understand the effect of buffers on neotropical migrants.

PREVIOUS RESEARCH

Breeding Bird Survey and other population count data indicate that neotropical migrant populations are declining (Hamel et al 1996). It is the habitat requirements of these birds that are still unknown. Few studies have examined the habitat requirements of riparian forest-dwelling birds. Most research on habitat requirements has been concerned with differences in vegetation. It is imperative that we understand the habitat requirements of neotropical migrants to prevent further population declines. This study focuses on river and stream characteristics, as well as those of the floodplain, because they are such important features of riparian forests.

Only one study has investigated the use of a stream classification system in conjunction with a bird community. Buckton and Oremond (1997) investigated how well a river habitat survey would predict habitat requirements of river birds. Their study took place along 74 streams in the United Kingdom. They found that the classification system variables were correlated with the distributions of several bird species. They concluded that river habitat surveys are an important tool in predicting river bird distributions.

The effect of buffers, or streamside management zones (SMZ), on bird species has been studied intensively, but not in conjunction with species habitat requirements. Thurmond et al (1995) conducted a study in Georgia to test the effect of SMZ width on the abundance and densities of breeding and wintering birds. They found that the density of birds within the narrow buffer zone was greater than in the other treatments. Edge species were common in all buffer widths and in plantations, whereas few occurred in the control or interior forested areas. Neotropical abundance increased with increasing buffer width, but increased buffer width did not significantly increase total bird abundance. Other studies have had similar results (Hodges and Krementz 1996; Kilgo et al 1998; Meiklejohn and Hughes 1999), however, none of these studies investigated the stream or floodplain characteristics, besides vegetation. Kilgo et al (1996) conducted a similar study in bottomland hardwoods in South Carolina. They estimated approximately 70 bird species breed in bottomland hardwoods, 30 of which are neotropical migrants. They compared species abundance and richness among hardwood stands of varying widths that were surrounded by closed-canopy pine, and found highest densities in the narrow buffer widths. It seems that the key feature of bottomland hardwood forests, the stream, is being overlooked when studying bird abundance and diversity in these forests.

STUDY DESIGN

Site description

Thirty stream sites were chosen in the Piedmont region of Georgia. All are located within Oconee National Forest and Weyerhaeuser and Timber Company lands. Sites were chosen according to location, stream and floodplain characteristics. Streams range in size from first to fifth orders. Of the thirty sites, three are beaver impoundments, six are clearcut with a streamside management zone and the remainder are contained in interior forests, with a variety of stream and floodplain widths.

A 400-meter transect was established along each stream. The beaver impoundments and three clearcut sites have shorter transects, with lengths equal to the length of the pond or cut. Each transect runs parallel to the stream and follows any bends or meanders. Transects were flagged at 25-meter intervals.

Bird community censuses

Bird counts were conducted from early May through June 2000 beginning at sunrise and continuing no later than 10:00 am EST. Each site was censused twice; the surveys will be repeated during spring 2001. Five-minute fixed-radius point counts were conducted 50 meters from the origin and terminus of each transect, 50-meter radius flags were placed as visual references for each point count. Transect surveys were also

conducted by walking the entire length of the transect and counting all birds seen or heard within 50 meters (Noon 1970; James and Shugart 1970).

Stream habitat surveys

Habitat surveys (Hankin and Reeves 1998) were carried out once on each stream in the study. Reach length was determined by averaging bankfull width (the level of bankfull flow) and channel width, then multiplying by 20. Reach length is used to give a snapshot of the stream in its entirety. Within each reach, habitat units (pools, riffles and glides) were identified. The location of each unit within the reach was recorded along with its channel width, flow width, length and maximum depth. The dominant substrate size was identified. The amount of woody debris within each unit was recorded along with its diameter and length. Any pool forming agents (dams, debris piles) were indicated. Channel slope was estimated using a level. Canopy cover was determined using a spherical densiometer. Substrate size class distribution was determined using a modified Wolman pebble count (Wolman 1954). Bank slope and percent of vegetation on the banks was recorded.

Floodplain surveys-

Floodplain length was measured using the standard level and increment rod. Any terraces, tributaries and channels in the floodplain were measured using this method.

Vegetation surveys

Each transect was divided into 50-meter intervals. Box plots were used to identify tree, shrub and herbaceous ground cover. Every 50 meters, a 10x10m plot was established for tree identification. The number of species was recorded along with the diameter at breast height (dbh). At each 50-meter interval, a 5x5m plot was established for shrubs and 1x1m for herbaceous ground cover. Again, the number of species within the plots was recorded. These surveys were conducted simultaneously to the bird counts, so as to identify possible food sources for the birds.

DISCUSSION AND PRELIMINARY RESULTS

Quantifying geomorphologic variables increases our understanding of the habitat requirements of bottomland forest-dwelling birds. Community differences may be determined by comparing interior forests and clearcut buffer zones and help recognize the effect of buffers on interior bird communities. Our preliminary transect count data are presented in Table1.

Table 1. The table provides information on site location by name, estimated stream order, number of bird species counted during transect counts and number of "sensitive" species (Acadian Flycatcher-ACFL and Louisiana Waterthrush-LOWA). Point count data are not provided. Data provided for 29 sites.

Site Name	Est. Stream Order	ACFL or LOWA Present	#Birds Present
Rock Eagle1	1	AC,LO	11
Rock Eagle 2	1	AC,LO	15
BFG Forest	1	AC,LO	15
BFG Pine	1	ACFL	8
Old Penfield	1	ACFL	12
702	2	ACFL	8
1234B Marsh	2	AC,LO	10
1234B Forest	2	AC,LO	12
1231 D	2	AC,LO	9
1266	2	AC,LO	14
684	2	AC,LO	14
Glades	2	AC, LO	11
Cedar Creek	3	AC,LO	13
Pippin Rd	3	ACFL	12
Towns Ck	3	ACFL	9
Fishing Ck.	3	AC,LO	11
Falling Ck.	3	AC,LO	10
Little Glady	3	AC,LO	14
Little River	5	AC,LO	11
Murder Ck.	5	ACFL	12
787 (CC)	1	LOWA	10
758 (CC)	1	AC,LO	10
707 (CC)	1	ACFL	10
Hadaway (CC)	1	ACFL	10
626 (CC)	2	LOWA	13
625 (CC)	5	AC,LO	14
BFG Beaver	N/A	no	10
Old Penfield Beaver	N/A	ACFL	14
1234B Beaver	N/A	no	7

Table 1 illustrates that our clearcut sites are supporting bird communities that are as abundant as interior forests. Although, the species makeup within the communities may vary between sites. Edge species are typically more abundant within the clearcut sites. All of our clearcut sites have at least one "area sensitive" species present (Louisiana Waterthrush (*Seiurus motacilla*) and Acadian Flycatcher (*Empidonax virescens*). These species do not seem to be supported in beaver pond communities.

We intend to conclude that stream and floodplain geomorphology does play an important role in the habitat requirements of neotropical migrants. In the future, we will determine which geomorphologic variables are most important as habitat requirements for these bird communities.

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